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EXAMINER	
WONG, LESLIE	

ART UNIT	PAPER NUMBER
2164	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/056,880	MILBY, GREGORY H.	
	Examiner	Art Unit	
	LESLIE WONG	2164	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 June 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-12,16,17,21,22,25-28 and 30-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *3-9,25,26 and 31* is/are allowed.

6)☒ Claim(s) *2,10-12,16,17,21,22,27,28,30 and 32* is/are rejected.

7)☒ Claim(s) *29* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10/26/2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 32 is rejected under 35 U.S.C. 102(e) as being anticipated by **Agarwal; Nipun et al.** ('Agarwal') US 6351742 B1.

Regarding claim 32, Agarwal teaches a method of performing a join in a database system, comprising:

receiving a join query specifying a joining of a first table and a second table and containing at least one of a selection predicate and a projection (col. 4, lines 45-47);

selecting a join path for the join query in response to determining whether the at least one of the selection predicate and projection is applied on a complex attribute (col. 7, lines 27-37; col. 6, lines 19-51),

wherein a first join path is selected in which the at least one of the selection predicate and projection is applied on a join table in response to determining that the at least one of the selection predicate and projection is applied on a complex attribute, the join table containing a join result of the first and second tables (col. 4, line 45- col. 5, line 21; col. 6, lines 34-51; and col. 6, line 66 – col. 7, line 6; col. 7, lines 27-37), and

wherein a second join path is selected in which the at least one of the selection predicate and projection is applied on the first table before the join in response to determining that the at least one of the selection predicate and the projection is applied on a non-complex attribute (col. 5, lines 20-44).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 11-12, 16-17, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Paulley; Glenn Norman** ("Paulley") (US 6516310 B2) in view of **Jakobsson; H.ang.kan** ("**Jakobsson**") (US 6377943 B1).

Regarding claim 11, **Paulley** teaches an article comprising at least one storage medium containing instructions that when executed cause a database system to:

receive a join query containing at least one function selected from the group consisting of a selection predicate applied on a complex attribute, a projection applied on a complex attribute, and a user-defined data type method, *the join query specifying a join of a first table and a second table to produce a join table* (col. 9, lines 11-20 and 40-62; col. 8, lines 55-56); and

determine a join path for the join query based at least in part on a cost associated with application of the function (col. 9, lines 55-56 and col. 11, lines 59-66),

Paulley does not explicitly teach wherein determining the join path comprises selecting the join path in which the function is applied on the join table rather than the first table or second table to reduce cost.

Jakobsson, however, teaches determining the join path comprises selecting the join path in which the function (i.e., function is interprets as a join of a first table and a second table) is applied on the join table rather than the first table or second table to reduce cost as the order in which the tables are joined may have a significant effect on the performance of the database system. For example, joining the order table 502 with the customer table 504 first results in a single tuple, which helps to constrain the amount of input/output in later join operations, but joining customer table with sales associate table 508 results in a Cartesian product of twelve tuples, larger than any of the tables and very expensive to process (col. 1, lines 55-63; col. 2, lines 2-30; col. 2, lines 59-65).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teachings of the cited references because **Jakobsson's** teaching would have allowed **Paulley's** to select the best join order of the join operations in order to determine the least cost join path.

Regarding claim 12, **Paulley** further teaches wherein the join query specifies the function being applied on the first table, and wherein the instruction when executed

cause the database system to determine the join path in which the function is applied on the join table (col. 11, lines 1-11).

Regarding claim 16, **Paulley** further teaches wherein the instructions when executed cause the system to determine the join path by further specifying a join of the join table and a third table to produce a fourth table (col. 15, lines 51 to col. 16, line 37).

Regarding claim 17, **Paulley** further teaches wherein the join query further specifies application of a second function selected from the group consisting a selection predicate applied on a complex attribute, a projection applied on a complex attribute, and a user define data type method, the second function being applied on a third table (col. 11, lines 12-26),

Wherein the instructions when executed cause the database system to determine the join path by further applying the second function one of the third table and the fourth table with a lower cardinality (col. 12, lines 32-38).

Regarding claim 28, **Paulley** further teaches the steps of:

Receive a second query specifying a join of the first table and another table, the second query specifying at least one of a selection predicate applied on a non-complex attribute and a projection applied on a non-complex attribute (col. 9, lines 11-20 and 40-62); and

Select another join path for the second query in which selection or projection is applied on one of the first table with the second table (col. 12, lines 32-35).

5. Claims 2, 10, 21-22, 27, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Paulley; Glenn Norman** ("Paulley") (US 6516310 B2) in view of **Agarwal; Nipun et al.** ('Agarwal') US 6351742 B1.

Regarding claims 2 and 21, **Paulley** further teaches a database system comprising:

A storage system to store tables (Fig. 1, element 107); and

An optimizer to receive a join query that specifies a function selected from the group consisting of a selection predicate applied on a complex attribute, a projection applied on a complex attribute, and a user-defined data type method (col. 9, lines 11-20 and 40-62; col. 8, lines 55-56);

The optimizer to select a join plan based at least in part on a comparison of a first cost of applying the function on a first table and a second cost of applying the function on a second table, wherein the optimizer is to select the join plan that applies that function on the one of the first table and second table with a lower cardinality, wherein the second table is a join result of the firs table and another table (col. 9 lines 36-40, col. 11, lines 59-66 and Fig. 3; col. 12, lines 32-38);

Paulley does not explicitly teach wherein the join query specifies the function being applied on the first table, and the optimizer to apply the function on the second

table rather than the first table in response to determining the second cost is lower than the first cost.

Agarwal, however, teaches wherein the join query specifies the function being applied on the first table, and the optimizer to apply the function on the second table rather than the first table in response to determine the second cost is lower than the first cost (col. 4, line 45- col. 5, line 21; col. 6, lines 34-51; and col. 6, line 66 – col. 7, line 6; col. 7, lines 27-37).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teachings of the cited references because **Agarwal's** teaching would have allowed **Paulley's** to select the best join order of the join operations in order to determine the least cost join path.

Regarding claims 10 and 22, **Paulley** further teaches wherein determining the costs of applying the function on the first and second tables comprises determining the costs of applying the function on object relational tables (col. 8, lines 34-37).

Regarding claim 27, **Paulley** teaches a method of performing a join in a database system comprising:

Receiving a join query containing at least one function selected from the group consisting of a selection predicate applied on a complex attribute, a projection applied on a complex attribute, and a user-defined data type method (col. 9, lines 11-20 and 40-62; col. 8, lines 55-56);

Determining a cost associated with applying the function on a first table and a cost associated with applying the function on a second table (col. 9 lines 36-40, col. 11, lines 59-66 and Fig. 3); and

Selecting a join path based on relative costs of applying the function on the first and second tables (col. 9 lines 36-40, col. 11, lines 59-66 and Fig. 3), and

Wherein the query specifies application of the function on the first table (col. 16, lines 15-16),

Wherein selecting the join path comprises selecting the join path in which the function is applied on the second table, the second table containing a join result of a join of the first table and another table (col. 16, lines 14-22 and col. 6, lines 9-12).

Regarding claim 30, **Paulley** further teaches the steps of:

Receive a second query specifying a join of the first table and another table, the second query specifying at least one of a selection predicate applied on a non-complex attribute and a projection applied on a non-complex attribute (col. 9, lines 11-20 and 40-62); and

Select another join path for the second query in which selection or projection is applied on one of the first table with the second table (col. 12, lines 32-35).

Allowable Subject Matter

6. Claims 3-9, 25, 26, and 31 are allowed.

7. Claim 29 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: Prior art of record fails to teach a combination of elements including an optimizer module performing N-lookahead join planning in which costs for different combinations of joins of N+2 tables are determined, where N is greater than or equal to one as recited in dependent claim 29.

Response to Arguments

8. Applicant's arguments with respect to claims 11, 21, and 27 filed on 06/17/2008 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues that Paulley does not disclose the limitation: "selecting the join path in which the function is applied on a join table rather the first or second table" and that the prior art only refers to performing cost estimation to compare costs of partial access plans so that the "optimizer can quickly prune significant portions of the join strategy search space" Paulley 9:38-40.

In response to the above arguments, Examiner submits that although Paulley does not explicitly spell out the feature "selecting the join path in which the function is applied on a join table rather the first or second table"; the fact that the prior art teaches

the "join enumeration", it teaches applying the function on a join table. As the "join enumeration", which iteratively adds another table (i.e., join tables) to the prefix of a join strategy (i.e., apply function on a join table), whose length is denoted by Lp, until the strategy is completely determined at which point the strategy's cost is estimated and the ranking is performed on the tables. The optimizer will choose the join strategy which contains the fewest Cartesian products (col. 11, lines 12-15; lines 32-39; col. 12, lines 32-35). It is well-know that if a query contains many join conditions, the system will enumerate specified tables to find out the join path or order which will produce the least cost query. As a result, reference Jakobsson is applied to reinforce Paulley's teaching because Jakobsson reference provides more examples on best cost join order based on technique such as "heuristic approach", "exhaustive search", "prunning", and "cut-off search" etc… (col. 2 and col. 3).

Applicant argues that Agarwal does not teach selecting the first join path of claim 32, in which the selection predicate or projection of the join query is applied on the join table.

In response to the preceding arguments, Examiner respectfully submits that Agarwal teaches the above limitation as based on the available access paths, the optimizer then generates one or more possible execution plans. Each execution plan is directed to an alternate combination or order of steps to accomplish the results sought by the database statement. Depending upon the type of execution plans generated by the optimizer, the selectivity of the predicate in the database statement may be

computed (col. 4, lines 26-43). Agarwal further teaches passing a description of the argument(s) to the optimizer (col. 3, lines 36-39 and col. 4, lines 58-65). The system associates objects with non-native optimizer-related properties or operations. If the optimizer encounters an execution plan involving an object which is associated with a non-native optimizer-related function, that function is called to estimate the cost of that execution plan. For example, when a SQL statement is processed involving an object for which a non-native (i.e., complex attribute) selectivity function has been registered, the registered selectivity function can be called by the optimizer to determine the estimated selectivity of a predicate involving that object, and thus the cost of an execution plan involving that object. The relative costs of alternate execution plans can thereafter be compared to select the appropriate execution plan for execution (col. 6, line 64 – col. 7, line 6 and col. 7, lines 30-37). Accordingly, the prior art teaches the limitation "a first join path is selected … on a complex attribute …" as claimed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LESLIE WONG whose telephone number is (571)272-4120. The examiner can normally be reached on Monday to Friday 9:30am - 6:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, CHARLES RONES can be reached on (571)272-4085. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LW
September 28, 2008

/Leslie Wong/
Primary Examiner, Art Unit 2164